

SESSION I

MECHANICAL TENSION AND SIGNAL TRANSDUCTION

MECHANICAL FORCES AND THEIR SECOND MESSENGERS IN STIMULATING CELL GROWTH IN VITRO

Herman H. Vandenburg, Department of Pathology
Brown University and The Miriam Hospital
Providence, RI 02906

Mechanical forces play an important role in modulating the growth of a number of different tissues including skeletal muscle, smooth muscle, cardiac muscle, bone, endothelium, epithelium, and lung. As interest increases in the molecular mechanisms by which mechanical forces are transduced into growth alterations, model systems are being developed to study these processes in tissue culture. This paper reviews the current methods available for mechanically stimulating tissue cultured cells. It then outlines some of the putative "mechanogenic" second messengers involved in altering cell growth. Not surprisingly, many mechanogenic second messengers are the same as those involved in growth factor induced cell growth. It is hypothesized that from an evolutionary standpoint, some second messenger systems may have initially evolved for unicellular organisms to respond to physical forces such as gravity and mechanical perturbation in their environment. As multicellular organisms came into existence, they appropriated these mechanogenic second messenger cascades for cellular regulation by growth factors.